

## Application Notes: Cabin Pressure Propagation

### Importance of Cabin Pressure

The influence of the air trapped inside the cabin on a door closing event is significant. It is easily noticeable based on the improvement of one door's performance in case another door is opened. There is almost always a significant reduction of the required energy to close the door. The design and efficiency of this air evacuation system is a crucial part of the door system to achieve satisfactory closing performance.

**“The pressure needs to be right at the sweet spot to satisfy both opposite requirements.”**



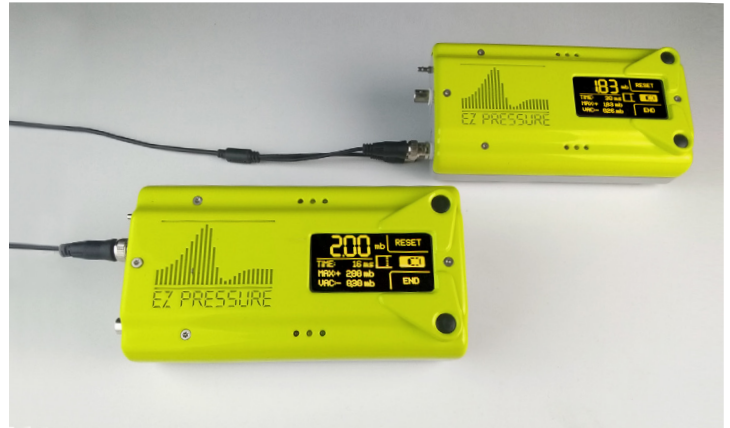
*Speed and pressure gauge placed on front seat.*

### Gauge 2: Pressure Sensor

A single EZPressure unit can evaluate the pressure behavior at a single location. This numeric evaluation will suffice for a troubleshooting or quality inspection procedure.

At research and design level, multiple units can be linked together to monitor the pressure propagation over the flow path. This collection will allow to measure the evolution of the pressure wave in function of location. For timing and synchronization accuracy, the devices are electrically connected with a trigger line.

Any unit can optionally be equipped with a small tube to collect a pressure variation at a very specific point that might be hard to reach locations. For example, right in front of the extractor valve.



*Multiple EZPressure units connected.*

### Evacuation or Leaks

The challenge is to find a balance. On one side there is a well-sealed cabin to insulate the occupants from wind and driving noises. On the other side, a controlled system to enable air evacuation when it is required. This balance implies that none of the extreme cases can meet all the requirements. The most efficient approach is to measure the effects and make sure the target is right at the sweet spot to satisfy both opposite requirements.

### Gauge 1: Speed Sensor

In order to perform an efficient evaluation, multiple measurement components are required. The dependency of the cabin pressure to the door speed is obvious. The faster the user closes the door, the higher the pressure peak. For this simple reason, a speed gauge is a basic component in the study of the air extraction.



*Pressure gauge placed on the back seat.*

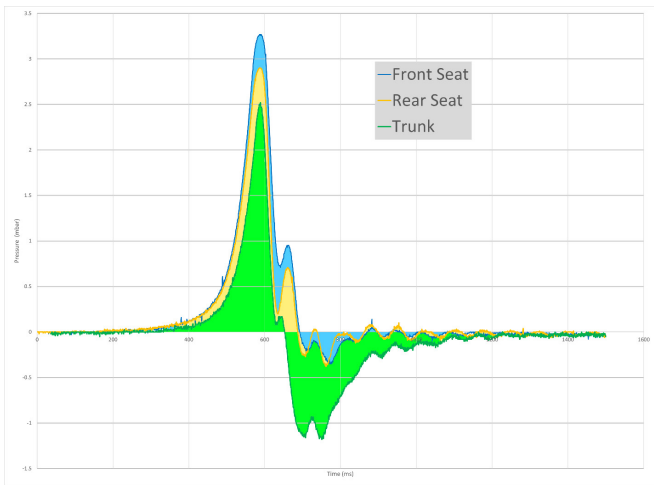
# Application Notes:

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### Path Analysis

The pressure wave that is generated by the movement of the door will travel from the area around the door, through the rest of the cabin all the way to the extractor valve. This extractor is often located in the back of the vehicle. Similar to other fluid dynamics, the resistance of the total path will be the combination of all individual restrictions it has to overcome.

**“Identify the bottlenecks for improvement of the efficiency of the evacuation.”**



After a door slam test, the speed and pressure data can be downloaded in the Audit software for review and analysis. Each zone can be characterized, and an energy loss can be established based on the size of the pressure wave. These numbers will identify or highlight the bottlenecks or any potential to improvement of the efficiency of the evac. All without compromising the cabin insulation or sealing systems and maintain noise performance.

For more details, please visit our **EZPressure** product page at [www.ezmetrology.com](http://www.ezmetrology.com).



Pressure gauge placed in the trunk.

### Data Collection

For this application, the operator installs the EZSpeed on the door to register closing speed and 3 EZPressure Units inside the vehicle. The first one near the front door, the second one on the rear seats and one in the trunk. This could still be expanded for example with one pressure sensor in front of the extractor valve or on any other critical place in the path.

